RESPONSE TO COMMENTS FROM THE STATE OF MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION ON THE 1999 ANNUAL REPORT, MONITORING EVENTS 14 AND 15 SITES 1 AND 3 AND EASTERN PLUME NAVAL AIR STATION, BRUNSWICK, MAINE

COMMENTOR: Claudia Sait **DATED: 7 April 2000**

The Maine Department of Environmental Protection (MEDEP or Department) has reviewed the report entitled *1999 Annual Report, Monitoring Events 14 and 15, Sites 1 and 3 and Eastern Plume* (draft), dated March 2000, prepared by EA Engineering, Science, and Technology. Based on that review, the Department has the following comments and issues.

Each of our comments is followed with a code that indicates whether a response is required (RR), no response is required (NR), editorial correction needed (ED), or meeting discussion requested (MTG). No response is required for editorial corrections unless the Navy disagrees with the correction.

GENERAL COMMENTS

1. General comment for the Monitoring Event 15 (letter dated 10 January 2000) review stated that "several interesting relationships were noted and will be carried forward to the annual report." These observations were presented at the November 1999 Technical Meeting in Bedford, Massachusetts. Six points were expressed, supported by MEDEP-developed maps and figures. These themes are summarized below:

   - Convincing evidence does not exist to show that the current extraction well system is actually containing the Eastern Plume within the currently mapped bounds.

   - Current evidence suggests little, if any, plume shrinkage, and a low percentage of contaminant mass removed to date relative to the entire plume.

   - Remediation of solvent plumes is dependent on eliminating both the primary source and any secondary residual source in the subsurface. The possibility of dense, non-aqueous phase liquid in depressions on the clay surface or in shallow bedrock where exposed to the plume migration pathway should not be ignored.

   - Volumetric flushing of the Eastern Plume by remedial pumping has been very slow compared to recommended literature rates.

   - Optimization of pump-and-treat remediation of the Eastern Plume would benefit from a more thorough understanding of the subsurface stratigraphy, through the compilation and study of 3-D models.

   - Current data suggest that bio-attenuation of solvents in the Eastern Plume may be occurring in some areas and not in other areas within the plume

The Navy should keep these concepts in mind as it strives to improve optimization of the remedial efforts.

SPECIFIC COMMENTS

2. ***Background, Section 1.1, Page 1, 2nd Paragraph***—Remedial actions included placement of a low permeability cap and slurry wall and 2 ground-water extraction wells at Sites 1 and 3, and installation of 6 extraction wells at the Eastern Plume (Figure 1-2).

   After "installation," please insert "*...subsequent operation of...*" (ED)

   Response—The text has been revised as follows.

   "...wells at Sites 1 and 3, and installation and subsequent operation of 6 extraction wells..."

3. ***Long-Term Monitoring Program, Section 1.2, Page 2, 2nd Bullet***—Analyze the effective capture zone of the ground-water extraction system at Sites 1 and 3 and the Eastern Plume to determine if hydraulic control of the plume is being maintained.

   Because hydraulic control of the plume has not been demonstrated to date, it is inappropriate to indicate that the Navy is using monitoring to determine if control is being maintained. It would be good if this were the case. The Department suggests the following: "...to determine the degree of hydraulic control achieved through remedial pumping." (ED)

   Response—The sentence was revised as recommended.

   Analyze the effective capture zone of the ground-water extraction system at Sites 1 and 3 and the Eastern Plume to determine the degree of hydraulic control achieved through remedial pumping.

4. ***Location of Extraction Wells, Sites 1 and 3 and the Eastern Plume, Figure 2-1***—The locations of EW-6 and EW-7 seem to move around from report to report. In this figure, EW-6 is shown as too far west. Please correct these well locations. (ED)

   Response—The locations of EW-6 and EW-7 were checked. The locations of extraction wells EW-6 and EW-7 were corrected on Figure 2-1. The correct locations will used in future report figures.

5. ***Summary of Ground-Water Extraction and Treatment System Performance, Section 3.1, Page 3-1, 4th Bullet***—This similarity in total VOC concentrations suggest the deep ground water being withdrawn by EW-1 is not being diluted by groundwater also extracted from the shallow interval.

   The sentence reads as if EW-1 is extracting ground water from the shallow interval; in which case, the sample's volatile organic compound concentrations would be diluted by the clean shallow ground water. Because this well has a long screen that spans both shallow and deep sandy zones, it is reasonable to expect water contribution from the upper zone. A plausible

explanation of similar concentrations between EW-1 and MW-229A is that MW-229A is located closer to the plume's southern boundary than it is to EW-1 (giving low concentrations) and that EW-1 effluent is being diluted by the shallow zone. MEDEP recommends that in-well testing (flowmeter) be performed to verify that shallow ground water is not entering the upper screened interval at significant rates during pumping. (RR)

Response—This issue was discussed at the 11 April 2000 Technical Meeting. This statement was intended to note that the relative amount of dilution for EW-1 is believed to be lower than for other extraction wells. This sentence has been revised as follows:

> *This similarity in total VOC concentrations suggests the deep ground water being withdrawn by EW-1 is diluted by ground water extracted from the shallow interval to a lesser degree than at other extraction wells.*

6. ***Summary of Ground-Water Extraction and Treatment System Performance, Section 3.1, Page 3-2, 3rd Bullet***—What is the diameter of the connecting pipe? A 2-in. diameter pipe can handle 20-30 gal per minute. Is the Navy comfortable with this assessment? Please provide more details. (RR)

   Response—The common discharge piping has a diameter of 2 in. The approximate pumping rates of the wells are 18 gal per minute at EW-2A and 10 gal per minute at EW-2, for a total of 28 gal per minute. More or less water can be pumped from either well; however, the resulting pumping rate change is not a one-to-one relationship, due to hydraulic head differences between the two wells.

7. ***Summary of Water Level Gauging Program, Section 3.2, Page 3-3, 2nd Bullet***—Ground water immediately south of Mere Brook (near MW-230A and MW-231A) is interpreted to flow to the northeast.

   Granted, this is the direction that the potentiometric contour maps drawn to date indicate. The TCE reported at depth in CP-118 during the Supplemental Remedial Investigation appears to contradict this direction of flow. Future data collection in this area, now in the discussion stage, hopefully will provide an explanation for the past TCE at CP-118. (NR)

   Response—No response required.

8. ***Effects of Remedial Measures – Eastern Plume, Section 3.2.3, Page 3-4, 1st and 2nd Bullets***

   a. Wherever "cone of depression" is used in these paragraphs, it must be stated that the distances given refer to the radius of the cone, to eliminate any depth connotations. (ED)

      Response—A clarification has been added to these paragraphs. The phase "(horizontal distance)" has been added after the dimension is stated in these bullets (i.e., 75-100 ft [horizontal distance]).

   b. Also, in the first bullet, EW-3 and EW-5 should be reversed, and only Figure 8 shows ground-water contours in the shallow interval (at EW-5). Reference to Figures 10, 12,

and 14 are inappropriate here. Figure 8 should be eliminated from the second bullet. (ED)

Response—The revised text for the first bullet is stated below. Figure 8 reference will be removed from the second bullet.

> *The cone of depression in the shallow interval for EW-1, EW-2, EW-3, and EW-4 cannot be directly measured due to limited data points in the shallow intervals near these extraction wells. However, the cone of depression within the shallow interval can be inferred at approximately 75-100 ft (horizontal distance) at EW-1, EW-2, EW-3, and EW-4, based on the measured shallow drawdown documented in the vicinity of EW-5 (Figure 8 in Monitoring Event 15 Report).*
>
> *The cone of depression in the deep interval for EW-1, EW-2, EW-4, and EW-5 appears to be limited to 25 ft (horizontal distance) or less, as shown on Figures ~~8~~ 10, 12, and 14 from....*

9. ***Effects of Remedial Measures – Eastern Plume, Section 3.2.3, Page 3-5, 3rd Bullet***—The same problems in references wells and figures as in Comment No. 8 were found. (ED)

   Response—The text of the 3rd bullet was revised as stated below.

   > *A comparison of the cone of depression at EW-5 observed in the shallow interval (approximately 75 ft; horizontal distance) (Figure 8 from the Monitoring Event 15 Report) and the deep....*

10. ***Volatile Organic Compound Concentrations and Distribution, Section 3.3.1.2, Page 3-6, 4th Bullet***—Samples collected from shallow well MW-202A, located hydraulically cross-gradient to the landfill, have detected concentrations of VOCs above the State MEGs and/or Federal MCLs..."

    The Department believes that MW-202A is located downgradient of the landfill, not cross-gradient. As previously stated in other monitoring event reviews, the ground-water contours very likely parallel Mere Brook at the landfill, instead of cutting directly across the deep valley containing the brook. Under the Navy's contouring scenario, how could the landfill have impacted ground water quality at MW-202A (one of the proposed explanations in the last sentence of the bullet)? The Navy should undertake measures to resolve this ongoing question. (RR)

    Response—This sentence was meant to indicate MW-202A is located outside and upgradient of the opening of the slurry wall. It is likely that the significant decrease in VOC concentrations at MW-202A is the result of the emplacement of the slurry wall and landfill cap. It is likely this well was directly downgradient of the landfill before remedial measures were implemented, although recent ground-water elevation data suggest this well is located cross-gradient of the opening of the slurry wall.

To avoid confusion, the sentence has been revised as follows:

Samples collected from shallow well MW-202A, located hydraulically cross-gradient to the opening of the slurry wall surrounding the landfill, have detected concentrations of VOCs above the State MEGs and/or Federal MCLs....

11. ***Volatile Organic Compound Concentrations and Distribution – Eastern Plume, Section 3.3.2.1, Pages 3-7 and 3-8, 3rd paragraph under the 3rd Bullet***

    a. "These changing VOC concentrations are likely the result of natural ground-water flow and VOC migration to the south-southeast and groundwater extraction at EW-2, which..."

    Does the Navy mean to say "*EW-2A*" in place of "EW-2?" (ED)

    Response—The text has been revised as follows:

    "....ground-water extraction at EW-2A, which..."

    b. The individual well graphs in Appendix A-3 show that, for all wells listed at the top of Page 3-8, their total VOCs do not contain any contaminants of concern.

    Therefore, discussion of trends for VOCs in these wells is not of particular interest. Please delete this paragraph. (ED)

    Response—The Navy disagrees with MEDEP's opinion that the VOC trends in these wells are not of particular interest; the paragraph will remain in the report.

    c. In the 2nd paragraph, the trends discussed are stated as based on the last two years. However, MW-224 and MW-229A showed very slight increasing or stable trends in 1999, contrary to the overall 2-year trends. The 1999 Annual Report should emphasize trends that occurred in 1999. A 2-year trend (or longer) can also be presented, as long as the 1999 trend has also been discussed in the text. (NR)

    Response—No response is required.

12. ***Volatile Organic Compound Concentrations and Distribution – Eastern Plume, Section 3.3.2.1, Page 3-8 , 2nd Bullet on Page***—Monitoring well MW-334 is upgradient of MW-333 according to their respective potentiometric elevations, not downgradient as stated. Therefore, the theme of this bullet will need different support, if the Navy wants to define the plume boundary as between these wells. It is suggested that this paragraph be deleted. (RR)

    Response—The text of the bullet has been revised to remove the words "downgradient of MW-333." The remainder of the bullet is believed to be accurate and has been retained.

13. ***Eastern Plume, Section 3.4.1.2, Page 3-9, Last Sentence of Bullet***—These results strongly support the conclusion that VOCs from the deep plume are not impacting surface water.

This statement is too all-inclusive, as the lower reach of Mere Brook has not been sampled. Please narrow the scope of the statement by identifying the stream reaches where diffusion sampling and conventional sampling has occurred. (ED)

Response—The text was added to clarify the extent of the stream reach.

No VOCs were detected in surface water samples collected from Mere Brook and Merriconeag Stream during 1999 (sampling locations are shown in Figure 4 of the Monitoring Events 14 and 15 reports). The sampling results of these data reaffirm that VOCs……

14. ***Leachate Station Seeps, Section 3.4.3.1, Page 3-10, 1st Bullet***—Please identify where SEEP-09 is shown on a map in the report. If necessary, please include the seep on the appropriate figures and reference a figure in this bullet. (ED)

    Response—This seep location was added to the appropriate figure(s).

15. ***Eastern Plume, Section 3.4.3.2, Page 3-10***—Seeps 6, 7, and 8 are not located on any figures in the report, as far as MEDEP can tell. Please add these, and reference in this paragraph. (ED)

    Response—These seeps were added to the appropriate figure(s) and referenced in the appropriate paragraph.

16. ***Leachate Station Sediment, Section 3.4.4, Page 3-11***—Please add Sites 1 and 3 to the section title. (ED)

    Response—The recommended text was added to the section title.

17. ***Extraction System Refinement, Section 3.6.3, Page 3-13***

    a. The proposed data collection activities for hydrogeologic definition are good, but could be improved by adding natural gamma logging of all new boreholes. MEDEP has reviewed the gamma logs run by ABB-ES in extraction wells EW-1, EW-2, and EW-4 for the Navy in 1996 and the contacts of the major Brunswick Naval Air Station lithologic units can be determined with greater confidence from studying these logs. (RR)

       Response—The MEDEP comment is noted. It is anticipated that some form of down-hole geophysical logging may be used to collect geologic data in conjunction with extraction well replacement. The scope of the geophysical logging effort has not been determined at this time. We agree that geophysical logging can be used to identify geologic units with better accuracy than some boring logs.

    b. In the second paragraph under "Identify the locations of new extraction wells," the Department recommends that the 3-dimensional geometry of the lower sand aquifer also be reviewed. (RR)

Response—A Technical Meeting has been proposed for the Fall of 2000 to discuss all issues relating to the Eastern Plume geology at which time the 3-dimensional geometry of the lower sand unit can be raised as a topic for the agenda.

18. ***Additional Data Collection and Review, Section 3.6.4, Page 3-14, Last Bullet***

a. The "assessment window" for investigating currently unidentified preferential flow pathways for ground water at the southern boundary of the Eastern Plume is too narrow. MEDEP recommends substituting Orion Street for MW-231A. (RR/MTG)

Response—The text has been revised as follows:

...Eastern Plume between Orion Street in the vicinity of Site 2 landfill and Mere Brook....

b. Also, in the second sentence, natural gamma logging should be added to compliment electrical conductivity logging (see Comment No. 17 above). (RR)

Response—Natural gamma logging would require a borehole. The proposed work would be performed using only direct-push probe methods to screen a larger area more quickly and to mitigate investigative-derived waste. The current recommendation of membrane interface probe (MIP) and electrical conductivity logging is sufficient to obtain the necessary information needed to evaluate the location and screened interval of the replacement extraction wells in the Eastern Plume. These technologies can have more accuracy and higher resolution than natural gamma logging.